

WHAT IS CLAIMED IS:

- 1. A light emitting diode (LED) comprising:**
 - a buffer layer made of a GaN-based compound semiconductor, being grown on a substrate;**
 - an LED structural layer formed on the buffer layer, the LED structural layer further comprising an n-type GaN layer, a multiple-quantum-well structural layer, a p-type GaAlN layer, and a p-type GaN layer, in which the n-type GaN layer is made of a GaN-based compound semiconductor and formed on the buffer layer, the multiple-quantum-well structural layer being made of an InGaN serial compound and situated on the n-type GaN layer, the p-type GaAlN layer being made of a p-type GaAlN-based compound semiconductor and grown on the multiple-quantum-well structural layer, the p-type GaN layer being made of a p-type GaN-based III-V compound semiconductor and grown on the p-type GaAlN layer;**
 - a p-type quantum-dot epitaxial layer made of a InAlN compound, being grown on the p-type GaN layer of the LED structural layer, and part of the n-type GaN layer, the multiple-quantum-well structural layer, the p-type GaAlN layer, the p-type GaN layer, and the p-type quantum-dot epitaxial layer being removed by a single etching process;**
 - a p-type ohmic contact electrode made of Ni/AuBe material being formed on the p-type quantum-dot epitaxial layer and electrically connected therewith; and**
 - an n-type ohmic contact electrode being grown on the n-type GaN layer of the LED structural layer and electrically connected therewith;**
 - whereby a forward bias can be applied to the LED.**
- 2. A manufacture method for light-emitting diode (LED), comprising:**
 - disposing a substrate;**
 - growing a buffer layer on the substrate;**
 - growing an LED structural layer on the buffer layer, in which the LED structural layer comprises an n-type GaN layer, a multiple-quantum-well structural layer, a p-type GaAlN layer, and a p-type GaN layer; and**
 - growing a p-type quantum-dot epitaxial layer on the p-type GaN layer of the LED structural layer;**

wherein the p-type quantum-dot epitaxial layer is made of Ni/AuBe material and electrically connected with a p-type ohmic contact electrode, and the n-type GaN layer made of Ti/Pt/Al/Ti/Au material is electrically connected with an n-type ohmic contact electrode so that a forward bias is applied thereto.

3. The method according to Claim 2, wherein the p-type quantum-dot epitaxial layer is a thin film of $\text{Al}_x\text{Ga}_{(1-x-y)}\text{In}_y\text{N}$, where $0 \leq x, y < 1, 0 \leq x+y < 1$.
4. The method according to Claim 2, wherein the substrate is made any of sapphire, SiC, Si, GaAs, LiAlO_2 , LiGaO_2 , and AlN.
5. The method according to Claim 2, wherein the thickness of the p-type quantum-dot epitaxial layer is greater than 10\AA .
6. The method according to Claim 2, wherein an average coarseness of the p-type quantum-dot epitaxial layer is greater than 10\AA .